

THE EFFECTS OF COUNSELING-BASED TEACHING METHOD ON PHYSICS LEARNING ACHIEVEMENTS OF UPPER SECONDARY SCHOOL STUDENTS: FOCUSES ON WRITING DOWN A SELF-NOTE AND SUMMARIZING TECHNIQUES

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ABSTRACT

This study investigated the effects of using the counseling-based teaching method on the physics learning achievements of the upper secondary school students. The counseling techniques: writing down a self-note, and summarizing were selected to design and construct counseling-based lesson plans for teaching and assessing physics learning achievements of the thirty students participating. Three types of research instruments were used: (1) the platform and exit tests assessing physics learning achievements before and after learning in each module, (2) the counseling-based lesson plans and (3) the summative tests assessing physics learning achievement after using each lesson plan. Data analysis was in two parts: quantitative data in arithmetic mean, standard deviation, and dependent sample t-test and qualitative data by content analysis with two criteria: (1) the right understanding and misunderstanding in physics concepts shown by the students, and (2) the full understanding of physics concepts shown in the students' completed tasks. The findings of the study were:

- There was statistically significant difference of physics learning achievement score of students before and after using the counseling-based lesson plan at the .05 level.*
- After using technique of writing down a self-note, all students increased their physics learning achievement scores higher than the level of 50%. Moreover, 80% of students understood all physics concepts correctly and completely.*
- After using technique of summarizing, all students increased their physics learning achievement scores higher than the level of 50%. There were only a few low performance students showing their incomplete understanding of velocity vector component and formula.*

The results of the study were to generate pedagogical implications, in that, selected counseling-based techniques can be used in physics teaching in support of students to overcome their difficulties with understanding complex physics concepts at the upper secondary school level.

KEYWORDS: Physics Learning, Physics Teaching, Physics Learning Achievements, Counseling-Based Teaching Method, Counseling Techniques

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INTRODUCTION

Background/ Objectives and Goals

In Thailand, the Thai science curriculum prescribes physics teaching and learning in all levels and specific contents in detail, in the Basic Education Core Curriculum B.E. 2551 (A.D. 2008). For secondary level, students have to learn about motion, force, energy conservation, momentum and collision, waves, radioactivity and nuclear energy (Ministry of Education, 2008: 111). These physics contents are to be taught by physics teachers in all government and private schools. For the current physics teaching, the institute for the promotion of teaching science and technology (IPST) has recommended the effective physics learning activities such as hand-on mind-on activities and group activities base on inquiry process (IPST, 2004). Although this method has many benefits to the students, it revealed that Thai students has low proficiency in science both the national test (O-net) and international evaluation. It may be because physics contents are abstract, and uses the mathematic equations to solve the scientific problems. Therefore, the students who are weak in mathematics and/or less practiced in visualizing about the physics problems feel in mind that the physics is difficult and hard to understand.

To support these students to increase the confidence in physics learning, the counseling techniques may be used in class. It was showed in some research. For instance, Devi (2013: 1086 – 1088) explored the effect of counseling on the academic performance of college students. It indicated that there was an increase in the learning achievement scores by about 15%-25% among 43% of the students. William (2011: 811 – 817) studied the academic performance of the freshmen entering the Southwest Texas State College who participated in counseling activity. The finding presented that they got the higher grades. Lee (2009: 305 – 319) investigated the effect of using counseling techniques on and academic performance of American students. It found that students got better academic performance than the students who received other service types. The research indicated that the counseling techniques can help the students learn science effectively.

In this research, the writing down a self-note and the summarizing counseling technique were selected to apply and construct the counseling-based lesson plans. They were explained in brief as follows:

Note-Taking or Writing down a Self-Note

In psychology, writing down a self-note is the clients reporting to helps them recall the content and self-generated memory. This counseling technique can improve recall and understanding of clients and help the clients open their mind and reflect their thought.

Summarizing

Summarizing in counseling psychological aspect is the process that the counselor combines two or more of the client's thoughts, feelings or behaviors into a general theme. This technique often used to help the clients be clear in confusing topic they faced in their life.

To sum up, a researcher can see that the counseling technique may be integrated as a teaching method and may be used in science classroom to support the student jumped the learning achievement. Hence, the researcher has defined research objectives: (1) to integrate the counseling techniques as teaching methods into physics lesson plans on momentum and collision at the upper secondary school level, and (2) to use the constructed lessons in order to assess the effects of the counseling-based teaching method on physics learning achievements of the upper secondary school students.

METHODS

Population and Sample

The two hundred and thirty-eight upper secondary school students in Watsuthiwararam High School in Bangkok Metropolis was the population in this study. The thirty samples were selected on voluntary basis (grade, gender, age, year of physics study and physics grade point in previous semester), and grouped in three levels of performance: (1) low performance, (2) moderate performance, and (3) high performance. Each level has ten students.

Research Instruments

The Counseling-Based Lesson Plan

The lesson plans were designed and constructed by the researcher and validated by three physics specialists. The writing down a self-note and the summarizing techniques were integrated in the lesson plans and divided into two modules. Each module has three plans. The counseling-based learning activities in plans were designed basing on the principle of counseling and the person-centered counseling theory showed in Table 1.

Table 1: The Content and Counseling Technique Used in Counseling-Based Lesson Plan

Module	Contents and Sub-Contents	Used Counseling Technique
1	<u>Momentum and impulse force</u> 1.1 Impulse and impulse force 1.2 Conservation of linear momentum 1.3 Conservation of angular momentum	Writing down a self-note
2	<u>Collision</u> 2.1 Energy changing in collision 2.2 Stricken collision 2.3 Explosion	Summarizing

Module 1: Linear and Angular Momentum

The counseling technique used in the first three lesson plans was the writing down a self-note. The application of this technique to teaching process showed in diagram below.

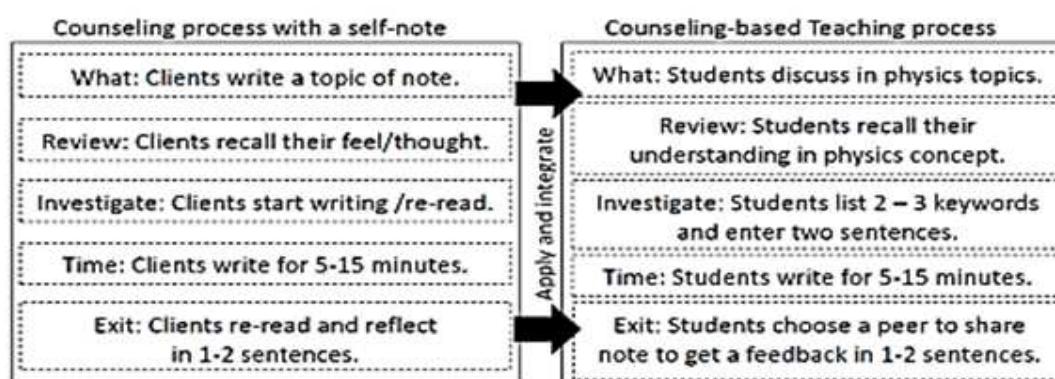


Figure 1: The Application of Writing down a Self-Note to Counseling-Based Teaching Process

Based on the diagram above, a teacher demonstrated the problem about the linear and angular momentum in daily life such as ball rebounding asked some questions, introduced some new terms, and proved the related momentum and impulse force equations. Then, the students used a note to reflect their understanding in physics concepts. The example of prototype showed as below:

Instructions:

- (1) The student is to pay attention to the teacher's explanation and demonstration to gain knowledge and definitions of impulse and impulse force.
- (2) [Column 1] The student is to list 2-3 keywords from understanding into the left-hand column of the note.
- (3) [Column 2] The student is to enter two sentences about his/ her understanding or limitations in understanding of each given keyword.
- (4) [Column 3] The student is to send a note to the teacher for the teacher's feedback [the teacher is supposed to enter feedback [in column 3]

Keywords	Two Sentences	Teacher's Feedback
1.		

Figure 2: A Self-Note Used in Module 1

Module 2: Collision

The counseling technique used in the second three plans was the summarizing. The application of this technique to teaching process showed in diagram below.

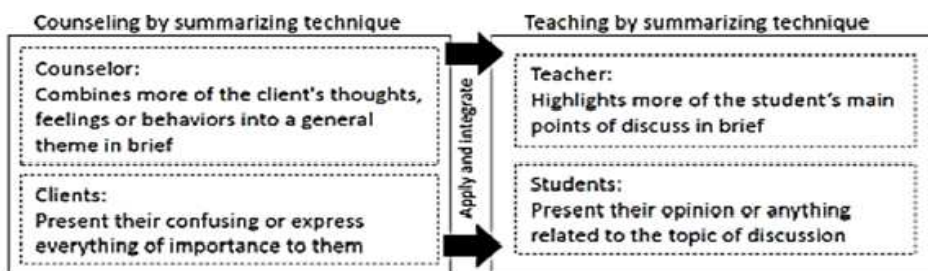


Figure 3: The Application of Summarizing to Counseling-Based Teaching Process

The diagram presented the summarizing integrated in teaching process. The video clips about collision were used to make discussions. During discussion [by students], the teacher wrote down the main points that each student spoke out in group on the board until the discussion activity finished. After that, the teacher highlighted and underlined the same and/or different points in each sentence that shown on the board and a teacher summarized the main points by write the main concepts (2 – 5 sentences).

The Platform Test and Exit Test

The two platform tests and two exit tests were used to assess the physics learning achievement before and after using counseling-based lesson plans, respectively.

The Summative Test

The six summative tests were used to assess the physics learning achievement after each lesson plan used completely.

Data Collection

The data collection of study was conducted in the first semester of academic year 2016. The procedure was done in the following steps:

The researcher contacted for permission from the school and arranged time to work on pilot study and actual study.

Before plans were used in class, the researcher explained the overview of course, objectives, the condition, and the assessment to students.

The first platform test was used before the using of lesson plans for Module 1.

Three counseling-based lesson plan and three summative tests were used.

The first exit test was used after the third lesson plan for module 1 was used.

The third step to the sixth step was done again but changed the lesson plan for module 2, respectively.

Data Analysis

The data analysis was divided into two parts: quantitative data and qualitative data.

Quantitative Data: The scores of each student after using each lesson plan were analyzed by arithmetic mean and standard deviation. To confirm the findings, the students' testing score before and after using integrated counseling-based lesson plans in each module were analyzed by t-test for dependent samples.

Qualitative Data: The students' task works in each module were analyzed by content analysis in order to describe the students' understanding and their limitation. The criteria of content analysis were (1) the right understanding and misunderstanding in physics concepts shown by the students, and (2) the full understanding of physics concepts shown in the students' completed tasks.

RESULTS

The Assessment of the Using of Writing down a Self-Note Technique Integrated in Plans

The platform test score, exit test score, and summative test score were analyzed, considered, and categorized into three groups of student mentioned above. The results were presented in Table 2 - 4 below:

Table 2: Result of Using Three Counseling-Based Lesson Plans: Writing down a Self-Note with High Performance Students, Analyzed from the Summative test 1-3

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
01	40	60	100	increased an reached a peak
02	40	100	100	reached a peak and be constant
03	40	80	100	Increased and reached a peak
04	40	60	60	Increased slowly and be constant
05	40	80	80	Increased and be constant
06	80	80	100	Be constant and reached a peak
07	40	60	60	Increased slowly and be constant
08	40	80	100	Increased and reached a peak
09	40	80	100	Increased and reached a peak
10	20	60	80	Increased and slowly increased

As shown in Table 2 above, the physics learning achievement score of high performance students was likely to increase at all. It was found that the sixty percentages of all high performance students reached a peak after using counseling-based lesson plan integrated with writing down a self-note technique in three times, except student number 02

reached a peak after using plans in two time. Besides, the rest of high performance students trended to increase their physics learning achievements slowly.

Table 3: Result of using Three Counseling-Based Lesson Plans: Writing Down a Self-Note with Moderate Performance Students, Analyzed from the Summative Test 1-3

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
11	80	80	100	Be constant and reached a peak
12	40	60	60	Increased slowly and be constant
13	40	60	80	Increased constantly
14	40	60	80	Increased constantly
15	60	80	100	Increased constantly and reach a peak
16	60	60	80	Be constant and increased slowly
17	40	60	80	Increased constantly
18	40	60	80	Increased constantly
19	40	80	100	Increased and reached a peak
20	40	40	80	Be constant and increased

As shown in Table 3 above, the physics learning achievement score of moderate performance students was likely to increase at all. It was found that thirty percentages of all moderate performance students reached a peak after using writing down a self-note technique in three times. In addition, forty percentages of all moderate students were able to develop their physics learning achievement score constantly. Besides, the rest of moderate performance students trended to increase their physics learning achievements slowly.

Table 4: Result of using Three Counseling-Based Lesson Plans: Writing Down a Self-Note with Low Performance Students, Analyzed from the Summative Test 1-3

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
21	20	40	80	Increased inconstantly
22	40	60	100	Increased slowly and reach a peak
23	40	80	80	Increased and be constant
24	60	60	80	Be constant and increased slowly
25	40	60	100	Increased slowly and reach a peak
26	40	80	100	Increased and reach a peak
27	20	40	60	Increased constantly
28	40	80	100	Increased and reach a peak
29	40	80	100	Increased and reached a peak
30	20	60	60	Increased and be constant

As shown in Table 4 above, the physics learning achievement score of low performance students was likely to increase at all. It was found that half students reached a peak after using writing down a self-note technique in three times. Moreover, twenty percentages of students were able to develop their physics learning achievement score constantly. Besides, there were two students trended to increase their score inconstantly whereas there was only one student trended to increase their score constantly.

To validate and confirm the result of this study presented above, the t-test for dependent sample was used and analyzed. They were illustrated in Table 5 below:

Table 5: The Result of using Three Counseling-Based Lesson Plans: Writing Down a Self-Note, Analyzed from the Platform Test 1 and Exit Test 1

Group of Students	N	$\bar{X}$	SD	T-Test
Group 1: High group Before using lesson plans After using lesson plans	10, 10	3.20, 8.40	0.75, 1.50	13.06*
Group 2: Moderate group Before using lesson plans After using lesson plans	10, 10	1.80, 7.30	0.63, 1.70	9.09*
Group 3: Low group Before using lesson plans After using lesson plans	10, 10	1.60, 6.40	0.70, 1.17	9.33*

*p<.05, df = 9

As shown in Table 5 above, the result indicated statistically significant difference of physics learning achievement score of all groups of student before and after using the counseling-based lesson plan at.05 level.

The qualitative data were analyzed from the students' task in class. For module1, students asked to write down a self-note. Students' data were analyzed, considered, and categorized into three groups of student. The results were presented in a bar chart below:

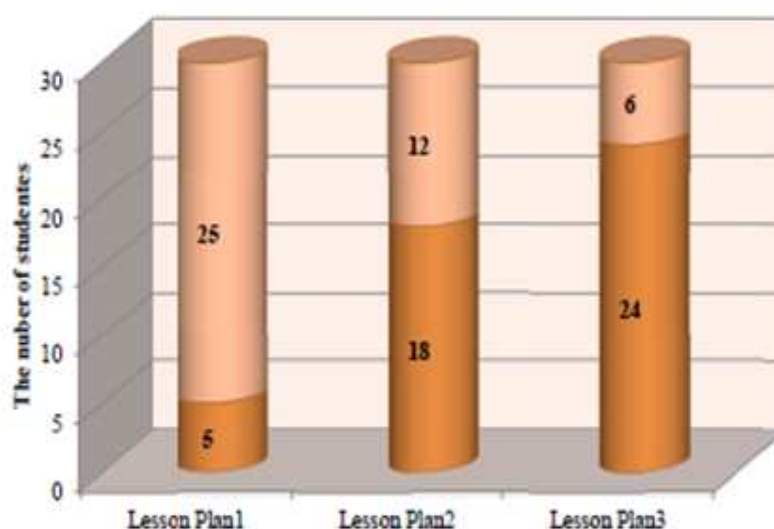


Figure 4: A Number of Students Who Understand All Physics Concepts Correctly and Completely

From the bar chart, most students got the understanding of physics concepts. After using the first plan, five students understood all physics concepts correctly and completely whereas the rest misunderstood in some concepts, especially, the definition of impulse and impulse force. Next using a plan, a number of students who understood all physics concepts correctly and completely were likely to increase. Then, the last plan was used, twenty-four students understood all physics concepts correctly and completely whereas six students understood all physics concepts correctly but not completely. They did not concern in angular momentum conservation formula.

The Assessment of the using of Summarizing Technique Integrated in Plans

- The results of using summarizing technique in class were showed in Table 6-8 below:

Table 6: Result of using Three Counseling-Based Lesson Plans: Summarizing with High Performance Students, Analyzed From the Summative Test 4-6

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
01	80	80	100	Be constant and reached a peak
02	60	80	100	Increased constantly and reached a peak
03	80	100	100	Increased slowly and reached a peak
04	60	80	100	Increased constantly and reached a peak
05	80	80	80	Be constant
06	80	80	100	Be constant and reached a peak
07	60	80	80	Increased slowly and be constant
08	40	80	100	Increased and reached a peak
09	60	80	80	Increased slowly and be constant
10	80	80	80	Be constant

As shown in Table 6 above, the physics learning achievement score of most high performance students was likely to increase. It was found that sixty percentages of all high performance students increased their scores and reached a peak later after using summarizing technique, especially, student number 03 reached a peak after using plans in two times.

Table 7: Result of using Three Counseling-Based Lesson Plans: Summarizing with Moderate Performance Students, Analyzed from the Summative Test 4-6

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
11	60	80	80	Increased slowly and be constant
12	40	60	80	Increased constantly
13	20	80	100	Increased rapidly and reached a peak
14	40	60	80	Increased constantly
15	20	100	100	Increased rapidly and reached a peak
16	40	80	80	Increased and be constant
17	60	60	80	Be constant and increased slowly
18	60	80	80	Increased slowly and be constant
19	80	100	100	Increased slowly and reached a peak
20	60	60	100	Be constant and reached a peak

As shown in Table 7 above, the physics learning achievement score of moderate performance students was likely to increase. It was found that forty percentages of all moderate performance students reached a peak after using summarizing technique in two to three times. In addition, the student number 12 and 14 increased their score constantly. Furthermore, the student number 11, 16, and 18 increased their score at first and be constant later, whereas there was only one student did not increase their scores at first and can develop their performance after using three plans.

Table 8: Result of using Three Counseling-Based Lesson Plans: Summarizing with Low Performance Students, Analyzed from the Summative test 4-6

Student Number	Physics Learning Achievement Score (%)			Development of Physic Learning Achievement Score
	Test 1	Test 2	Test 3	
21	60	60	60	Be Constant
22	60	60	80	Be constant and increased slowly
23	40	60	60	Increased slowly and be constant
24	40	80	100	Increased and reached a peak
25	60	60	80	Be constant and increased slowly
26	60	80	100	Increased and reach a peak
27	80	80	80	Be constant
28	20	80	80	Increased rapidly and be constant
29	60	60	80	Be constant and increased slowly
30	60	60	80	Be constant and increased slowly

As shown in Table 8 above, the physics learning achievement score of low performance students was likely to increase. It was found that forty percentages of all low performance students were not be able to increase their scores at first, but their scores increased after using counseling-based lesson plan integrated with summarizing in three time. Besides, the forty percentages of all low performance students can increase their scores, especially; student number 24 and 26 can reach a peak. However, there was only two students did not improve their physics learning achievement after using plans.

To validate and confirm the result of this study presented above, the t-test for dependent sample was used and analyzed. They were illustrated in Table 9 below:

Table 9: The Result of using Three Counseling-Based Lesson Plans: Summarizing, Analyzed From the Platform Test 2 and Exit Test 2

Group of Students	n	$\bar{x}$	SD	T-Test
<u>Group 1: High group</u> Before using lesson plans After using lesson plans	10,,10	3.10,,10.50	0.70,,0.92	17.34*
<u>Group 2: Moderate group</u> Before using lesson plans After using lesson plans	10,,10	2.40,,7.70	0.70,,1.49	13.39*
<u>Group 3: Low group</u> Before using lesson plans After using lesson plans	10,,10	1.70,,8.50	1.51,,0.67	15.38*

*p<.05, df = 9

As shown in Table 9 above, the result indicated statistically significant difference of physics learning achievement score of all groups of student before and after using the counseling-based lesson plan at.05 level.

The qualitative data were analyzed from the students' task in class. For module2, students discussed about inelastic collision issues while a teacher summarized the main points that students presented by writing these main points on the board. The teacher highlights and underlines the same and/or different points in each sentence with a color pen. The discussion issues in each plans and content analysis were presented in Table 10.

Table 10: The Content Analysis of Students' Group Discussion

Topics	Right Understanding	Misunderstanding
Why does height of ball while it rebounds on the ground unequal?	1. The potential energy is related to this problem. 2. Kinetic energy change to potential energy	1. Velocity is zero when a ball moves on ground. 2. The gravity effects on the Kinetic energy.
How to calculate the energy lost and velocity after crashing?	1. The velocity component; v_x and v_y , need to find at first. 2. The initial total momentum is equal to the final one. 3. There are two equations of conservation of momentum to solve the problem.	1. The total momentum is zero. 2. The final velocity of two objects are equal. 3. The velocity component in x-axis is $v\sin\theta$. 4. Energy is a vector. 5. Velocity angle is 90° .
How to calculate the energy lost and bomb's velocity after exploding?	1. The velocity component needs to find at first. 2. The momentum is conserved.	1. The vector component in x-axis or y-axis is not found. 2. The vector direction is equal.

For qualitative analysis showed in Table 10, twenty-four students understand physics concepts whereas the rest misunderstood in some concepts, especially, the velocity and kinetic energy. Next plan, there were some students who did not understand physics concepts in vector component. Then, the last plan was used, some student reviewed the concepts that they did not understand in the previous class or consult the teacher, especially low performance students.

This research revealed that the using of counseling-based lesson plans can help all groups of students increased their physics learning achievement scores, because of these reasons. For the using of writing a self-note technique, the students got the opportunity to recall the concepts that they learned, and reflected by a self-note independently. This applied method was corresponding to counseling method. Lo (2013: 20) explained that the note can help the clients review and elaborate on information. In the use of summarizing technique, the teacher helped students listen, and summarize the main points in discussion. The students were not worried about recoding the discussion points and can express their opinion independently and continually. Like the counseling method, Grant (2009: 15) said that the counselor had a role as person who connected between two or more topics of client's problem that they expressed and helped the client to decide which topic was the most important.

CONCLUSIONS

In conclusion, the researcher hopes that this research can be implicated, applied and used in class in many ways. For instance, the plans are models for science teachers to construct the counseling-based lesson plan used in own class to support students to overcome their difficulties with understanding complex physics concepts and applied in other subject areas.

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REFERENCES

1. Devi, M. R., et al. (2013). *The Effect if Counseling on the Academic Performance of College Students. Journal of Clinical and Diagnostic Research*, 6, 1086 – 1088.
2. Grant, S. (2009). *Counseling & Interviewing*. California: California State University.
3. Lee, D., et al. (2009). *The Effects of College Counseling Services on Academic Performance and Retention. Journal of College Student Development*, 50(3), 305 – 319.
4. Lo, C., (2013). *The impact of note-taking in counseling. A thesis for the degree of Doctor of Philosophy in Psychology. University of Iowa*.
5. William, F. (2011). *Student-To-Student Counseling for Academic Adjustment. The Personnel and Guidance Journal*, 43(8), 811 – 817.

